

TABLE 2

Elevation angle (a)	Relative e.i.r.p. density (dBW/MHz-km ²)
0° ≤ a ≤ 4.0°	e.i.r.p.(a) = e.i.r.p.(0°) + 20 log (sinIx)(1/Ix) where x = (a + 1)/7.5°.
4.0° < a ≤ 7.7°	e.i.r.p.(a) = e.i.r.p.(0°) - 3.85a + 7.7.
a > 7.7°	e.i.r.p.(a) = e.i.r.p.(0°) - 22.

(ii) LMDS system licensees in two or more BTAs may individually or collectively deviate from the spectral area density computed above by averaging the power over any 200 km by 400 km area, provided that the aggregate interference to the satellite receiver is no greater than if the spectral area density were as specified in Table 1. A showing to the Commission comparing both methods of computation is required and copies shall be served on any affected non-GSO MSS providers.

(4) *Power reduction techniques.* LMDS hub transmitters shall employ methods to reduce average power levels received by non-geostationary mobile satellite receivers, to the extent necessary to comply with paragraphs (c)(1) and (c)(2) of this section, by employing the methods set forth below:

(i) *Alternate polarizations.* LMDS hub transmitters in the LMDS service area may employ both vertical and horizontal linear polarizations such that 50 percent (plus or minus 10 percent) of the hub transmitters shall employ vertical polarization and 50 percent (plus or minus 10 percent) shall employ horizontal polarization.

(ii) *Frequency interleaving.* LMDS hub transmitters in the LMDS service area may employ frequency interleaving such that 50 percent (plus or minus 10 percent) of the hub transmitters shall employ channel center frequencies which are different by one-half the channel bandwidth of the other 50 percent (plus or minus 10 percent) of the hub transmitters.

(iii) *Alternative methods.* As alternatives to paragraphs (c)(4)(i) and (c)(4)(ii) of this section, LMDS operators may employ such other methods as may be shown to achieve equivalent reductions in average power density re-

ceived by non-GSO MSS satellite receivers.

[61 FR 26677, May 28, 1996, as amended at 61 FR 44182, Aug. 28, 1996]

EFFECTIVE DATE NOTE: At 61 FR 44182, Aug. 28, 1996, § 101.113 was amended in paragraph (a) by removing the entry for 27,500 to 29,500 MHz from the table and adding entries for 27,500 to 28,350 MHz and 29,100 to 29,250 MHz to the table and by adding a new paragraph (c), effective Oct. 28, 1996.

§ 101.115 Directional antennas.

(a) Unless otherwise authorized upon specific request by the applicant, each station authorized under the rules of this part must employ a directional antenna adjusted with the center of the major lobe of radiation in the horizontal plane directed toward the receiving station with which it communicates: *provided, however*, where a station communicates with more than one point, a multi- or omni-directional antenna may be authorized if necessary. New Periscope antenna systems will not, under ordinary circumstances, be authorized.

(b) Stations operating below 932.5 MHz that are required to use directional antennas must employ antennas meeting the standards indicated below. (Maximum beamwidth is for the major lobe of radiation at the half power points. Suppression is the minimum attenuation required for any secondary lobe signal and is referenced to the maximum signal in the main lobe.)

Frequency range	Maximum beamwidth (degrees)	Suppression (dB)
512 to 932.5 MHz	20	13

(c) Fixed stations (other than temporary fixed stations and DEMS nodal stations) operating at 932.5 MHz or higher must employ transmitting and receiving antennas (excluding second receiving antennas for operations such as space diversity) meeting the appropriate performance Standard A indicated below, except that in areas not subjected to frequency congestion antennas meeting performance Standard B may be used subject to the requirements set forth in paragraph (d) of this section.

ANTENNA STANDARDS

Frequency (MHz)	Category	Maximum beam width to 3 dB points (included angles in degrees)	Minimum antenna gain (dbi)	Minimum radiation suppression to angle in degrees from centerline of main beam in decibels						
				5° to 10°*	10° to 15°*	15° to 20°*	20° to 30°*	30° to 100°*	100° to 140°*	140° to 180°*
932.5 to 935	A	14.0	N/A	.....	6	11	14	17	20	24
	B	20.0	N/A	.....	.....	6	10	13	15	20
941.5 to 944	A	14.0	N/A	.....	6	11	14	17	20	24
	B	20.0	N/A	.....	.....	6	10	13	15	20
952 to 960 ^{8,9}	A	14.0	N/A	.....	6	11	14	17	20	24
	B	20.0	N/A	.....	.....	6	10	13	15	20
1,850 to 2,500 ¹¹	A	5.0	N/A	12	18	22	25	29	33	39
	B	8.0	N/A	5	18	20	20	25	28	36
3,700 to 4,200	A	N/A	36	23	29	33	36	42	55	55
	B	N/A	36	20	24	28	32	32	32	32
5,925 to 6,425 ⁵	A	N/A	38	25	29	33	36	42	55	55
	B	N/A	38	21	25	29	32	35	39	45
5,925 to 6,425 ⁶	A	N/A	38	25	29	33	36	42	55	55
	B	N/A	38	20	24	28	32	35	36	36
6,525 to 6,875 ⁵	A	N/A	38	25	29	33	36	42	55	55
	B	N/A	38	21	25	29	32	35	39	45
6,525 to 6,875 ⁶	A	1.5	N/A	26	29	32	34	38	41	49
	B	2.0	N/A	21	25	29	32	35	39	45
10,550 to 10,680 ^{4,5}	A	N/A	38	25	29	33	36	42	55	55
	B	N/A	38	20	24	28	32	35	35	39
10,550 to 10,680 ⁶	A	3.4	34	20	24	28	32	35	55	55
	B	3.4	34	20	24	28	32	35	35	39
10,565 to 10,615 ⁷	N/A	360	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10,630 to 10,680 ⁷	N/A	N/A	34	20	24	28	32	35	36	36
10,700 to 11,700 ⁵	A	N/A	38	25	29	33	36	42	55	55
	B	N/A	38	20	24	28	32	35	36	36
12,200 to 13,250 ¹²	A	1.0	N/A	23	28	35	39	41	42	50
	B	2.0	N/A	20	25	28	30	32	37	47
17,700 to 18,820	A	N/A	38	25	29	33	36	42	55	55
	B	N/A	38	20	24	28	32	35	36	36
18,920 to 19,700 ¹	A	N/A	38	25	29	33	36	42	55	55
	B	N/A	38	20	24	28	32	35	36	36
21,200 to 23,600 ¹⁰	A	N/A	38	25	29	33	36	42	55	55
	B	N/A	38	20	24	28	32	35	36	36
31,000 to 31,300 ^{2,3}	N/A	4.0	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Above 31,300	A	N/A	38	25	29	33	36	42	55	55
	B	N/A	38	20	24	28	32	35	36	36

*1 DEMS User Station antennas in this band must meet performance Standard B and have a minimum antenna gain of 34 dBi. The maximum beamwidth requirement does not apply to DEMS User Stations. DEMS Nodal Stations need not comply with these standards.

²The minimum front-to-back ratio must be 38 dBi.

³Mobile, except aeronautical mobile, stations need not comply with these standards.

⁴Except for antennas between 140° and 180° authorized or pending on January 1, 1989, in the band 10,550 to 10,565 MHz for which minimum radiation to suppression to angle (in degrees) from centerline of main beam is 36 decibels.

⁵These antenna standards apply to all point-to-point stations authorized after June 1, 1997. Existing licensees and pending applicants on that date are grandfathered and need not comply with these standards.

⁶These antenna standards apply to all point-to-point stations authorized on or before June 1, 1997.

⁷These antenna standards apply only to DEMS User Stations licensed, in operation, or applied for prior to July 15, 1993.

⁸Except for Multiple Address System frequencies listed in where omnidirectional antennas may be used.

⁹Antennas used at outlying stations as part of a central protection alarm system need conform to only the following 2 standards: (i) The minimum on-beam forward gain must be at least 10 dBi; and (ii) the minimum front-to-back ratio must be at least 20 dB.

¹⁰Except as provided in § 101.147(t). **Note to paragraph (10):** Stations must employ an antenna that meets the performance standards for Category A, except that in areas not subject to frequency congestion, antennas meeting standards for Category B may be employed. Note, however, that the Commission may require the use of high performance antennas where interference problems can be resolved by the use of such antennas.

¹¹Omnidirectional antennas may be authorized in the band 2150–2160 MHz.

¹²Except for temporary-fixed operations in the band 13200–13250 MHz with output powers less than 250 mW and as provided in § 101.147(q).

(d) The Commission shall require the replacement of any antenna or periscope antenna system of a permanent fixed station operating at 932.5 MHz or higher that does not meet performance Standard A specified in paragraph (c)

of this section, at the expense of the licensee operating such antenna, upon a showing that said antenna causes or is likely to cause interference to (or receive interference from) any other authorized or applied for station whereas a higher performance antenna is not likely to involve such interference. Antenna performance is expected to meet the standards of paragraph (c) of this section for parallel polarization. For cases of potential interference, an antenna will not be considered to meet Standard A unless the parallel polarization performance for the discrimination angle involved meets the requirements, even if the cross-polarization performance controls the interference.

(e) In cases where passive reflectors are employed in conjunction with transmitting antenna systems, the foregoing paragraphs of this section also will be applicable. However, in such instances, the center of the major lobe of radiation from the antenna normally must be directed at the passive reflector, and the center of the major lobe of radiation from the passive reflector directed toward the receiving station with which it communicates.

(f) Periscope antennas used at an electric power facility plant area will be excluded from the requirements of paragraph (c) of this section on a case-by-case basis where technical considerations or safety preclude the use of other types of antenna systems.

(g) In the event harmful interference is caused to the operation of other stations, the Commission may, after notice and opportunity for hearing, order changes to be made in the height, orientation, gain and radiation pattern of the antenna system.

§ 101.117 Antenna polarization.

Except as set forth herein, stations operating in the radio services included in this part are not limited as to the type of polarization of the radiated signal, provided, however, that in the event interference in excess of permissible levels is caused to the operation of other stations the Commission may, after notice and opportunity for hearing, order the licensee to change the polarization of the radiated signal. No change in polarization may be made without prior authorization from the

Commission. Unless otherwise allowed, only linear polarization (horizontal or vertical) shall be used.

§ 101.119 Simultaneous use of common antenna structures.

The simultaneous use of common antenna structures by more than one radio station, or by one of more domestic public radio stations and one or more stations of any other class or service, may be authorized: provided, however, that each licensee or user of any such structure is responsible for maintaining the structure, and for painting and illuminating the structure when obstruction marking is required by the Commission. (See § 101.21(a).)

§ 101.121 Marking of antenna structures.

The owner of each antenna structure required to be painted and/or illuminated under the provision of section 303(q) of the Communications Act of 1934, as amended, shall operate and maintain the antenna structure painting and lighting in accordance with part 17 of this chapter. In the event of default by the owner, each licensee or permittee shall be individually responsible for conforming to the requirements pertaining to antenna structure painting and lighting. For complete regulations relative to antenna marking requirements, see part 17 of this chapter.

§ 101.123 Quiet zones.

Quiet zones are those areas where it is necessary to restrict radiation so as to minimize possible impact on the operations of radio astronomy or other facilities that are highly sensitive to radio frequency interference.

(a) In order to minimize possible harmful interference at the National Radio Astronomy Observatory site located at Green Bank, Pocohontas County, W. Va., and at the Naval Radio Research Observatory site at Sugar Grove, Pendleton County, W. Va., any applicant for a station authorization other than temporary-fixed seeking a station license for a new station or to modify an existing station in a manner